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ENGINEERING EVALUATION/FACT SHEET

B ACKGROUND INFORMATION

Application No.:	R13-1934C
Plant ID No.:	033-00001
Applicant:	GrafTech International Holdings Inc.
Facility Name:	Anmoore
Location:	Anmoore
NAICS Code:	335991
Application Type:	Modification
Received Date:	March 21, 2013
Engineer Assigned:	Edward S. Andrews, P.E.
Fee Amount:	$1000.00
Date Received:	March 25, 2013
Complete Date:	June 18, 2013
Due Date:	September 16, 2013
Applicant Ad Date:	March 25, 2014
Newspaper:	*The Exponent Telegram*
UTM's:	Easting: 560.9 km Northing: 4,354.1 km Zone: 17
Description:	The application is to update Permit R13-1934B as required by in the facility's Title V.

ADDITIONAL BACKGROUND

GrafTech submitted this permit application to satisfy Condition 9.6.1. in the facility's latest Title V Operating Permit, which is the following:

9.6.1. In accordance with the GrafTech letter dated August 27, 2007 to Mr. Tephabock of WVDAQ the permittee shall submit an application to modify minor source NSR permit R13-1934B to reflect the results of the July 19, 2007 compliance test conducted in accordance with condition 9.3.2 of R30-03300001-2006. This modification application shall be submitted to DAQ within 180 days of permit issuance. This modification shall incorporate limitations for HCL as measured by 40CFR60, Appendix A, Method 26A. Additionally, the permit application shall propose operating parameter limits, which reflect the monitoring results of the July 19, 2007 stack test.

The following explanation was included in the Fact Sheet for this Title V Operating Permit:

Section 9.6 of the permit was updated to require the source to update their minor NSR permit R13-1934B to reflect the initial compliance testing conducted August 2006, on the (055) scrubber. However, a second test was conducted on July 19, 2007 after the first one failed to demonstrate compliance. Prior to the second testing event, which eventually demonstrated compliance, the permittee made changes to the scrubber to increase the efficiency of the unit. As a result, additional packing was added and the rate of caustic sent to the scrubber was increased. The test results defined a flow rate of 150 gpm of caustic, having a minimum pH of 12 and a caustic delivery pressure to the spray nozzles of 39 psig. Because of these significant operating parameter changes, the source proposed to update their minor NSR permit R13-1934B to incorporate the changes and findings from the test. This logic was relayed to DAQ in an August 27, 2007 letter from Bill Smith who was representing the company as a consultant at the time. However, no permit modification has been received by the DAQ. Therefore, it is in the writer's opinion that the minor source NSR permit needs to be updated under a compliance plan instigated by a the new condition, 9.6.1, of the proposed renewal permit. The permit application shall address new more descriptive emission limits, which include HCL instead of total chlorides to correlate with EPA's part 60 Method 26A. Additionally, the operating limits proven during the compliance test shall replace the old operating limits incorporated within permit condition 9.1.3.

DESCRIPTION OF PROCESS

GrafTech International Holdings Inc. (GrafTech) operates a carbon and graphite manufacturing facility in Anmoore, WV. As part of this facility, GrafTech uses seven induction furnaces to produce low ash content carbonaceous material. These furnaces were installed between 1983 and 1992 in accordance with previous editions of this permit.

During this process, GrafTech can purify the graphite product further if needed by the customer. GrafTech preforms this purification step in the induction furnace (#1 through 7). The purification process is an intermediate step in the carbonize process for these furnaces. During this phase, chlorine gas is injected into the furnace at a steady rate of 0.118 lb per minute (7.08 lb/hr).

This chlorine injection cycle is maintained for a predetermined length of time to allow for the chlorine to react with any impurities (iron) that are contained in the graphite material. Once the time period has elapsed, then nitrogen is injected to purge the chlorate gas out of the furnace. During the entire purification process, the furnace is vented to a packed bed scrubber using a caustic soda solution to neutralize the chlorine and chlorides in the purged gas before being released to the atmosphere. Chlorine is the only non-inert gas used in these furnaces. A complete firing cycle for one of these furnaces takes just under two weeks.

SITE INSPECTION

On April 17, 2013, Ms. Lou Ann Lee, Inspector assigned to the North Central Regional Office, and the writer conducted a site visit of the Anmoore Works. Mr. William Williams, HSEP Manager for GrafTech International, Ms. Lori Steele, a Senior Environmental Scientist with MSES Consultants, and key production personnel. The purpose of the visit is to provide the

writer a better understanding of the actual process, what are the limitations involved, and why a modification permit is required.

The production personnel explained that this purification process is only used to produce a pure graphite product for certain customers that required it. This purification step is used to react out the iron in the graphite. There are two sizes of these furnaces, which are AJAX (#1-4) and Pillar (#5-7).

For the chloride injection, the same equipment is used for all seven furnaces. Two chlorine cylinders are only able to be contacted to the injection system at a time. The chlorine cabinet has a scale, which allows the operators to accurately measure the total mass of chlorine injected in the furnace for a specific batch. The configuration of this metering system does not really allow purifying more than one furnace at time without causing operational issues (i.e. freezing up cylinders) or extending the actual cycle time.

The writer examined the packed bed scrubber, which is identified as 055. During the visit, no furnace was in operation. The scrubber is a typical packed bed scrubber with the spray bar above the packing. A small circulating pump was beside the scrubber which pumped the liquor from the base of the scrubber up to the spray bar. On the discharge side of the pump, the writer noted a pressure gage, a digital flow monitor, and another port for a second flow monitor. The writer noted that the pressure gage was reading 115 pounds per square inch (psi) and the flow rate 25 which was assumed to be in gallons per minute.

The writer presented the scrubber data from the August 1, 2006 and July 19, 2007 tests to the GrafTech folks and Ms. Steele. Clearly, there are issues in measurement of these parameters. The following table is the average of the parameters during the two tests.

Table #1 Scrubber Data from Emission Testing

Date	Scrubbing Liquor Flow Rate (gpm)	Discharge Pressure (psi)	ph reading (S.U.)
Aug 1, 2006	43.2	38.4	9.8
July 19, 2007	151.3	39.1	12.2

The writer inquired about visible emissions and vapor plume from emission point 055. The operation personnel noted that there are at times, vapor plumes present. The writer questioned the ability of the permittee to conduct Method 22 observations when a vapor plume is present.

ESTIMATE OF EMISSION BY REVIEWING ENGINEER

The applicant proposed no emission changes. However, the writer believes it is best to understand the issues and to review the emission potential of this process. In simple terms, the purpose of injecting chlorine is to get the iron out of the graphite. Thus, ferric chloride or ferrous

chloride should form when reacted with free chlorine. GrafTech injects more chlorine than is actually needed to get the iron to react out of the graphite, which results in free chlorine being emitted.

Free chlorine (Cl_2) is classified as a hazardous air pollutant under the Clean Air Act Amendments of 1990. Even though Ferric chloride and ferrous chloride are discharged from the furnaces in a gaseous state, these chlorides are regulated as particulate matter under the Clean Air Act.

Permit R13-1934B set limits for free chlorine, particulate matter, total chlorides and hydrochloric acid. Total chlorides are not a regulated pollutant. Certain individual chlorinate compounds are regulated and classified as HAPs (i.e. methylene chloride, and vinyl chloride, etc.). The writer believes that there are no other chlorides formed that are classified as HAPs except what has been specifically listed in the permit or application.

Two of the biggest problems in estimating emissions from this process are that it is a batch process and the rate of reaction (reaction efficiency) during the purification cycle is not steady state/ steady flow or known. Thus, the worst case is to assume that all of the chlorine injected is reacted to form the other pollutants.

GrafTech injects or meters a set flow rate of chlorine into the furnace. Using this flow rate and the minimum excepted removal efficiency for each pollutant published by Duall (manufacturer of the scrubber) with ph. controlled scrubber, the writer estimated the controlled emission rate for each pollutant. These estimates, current limits, and results for the two tests are presented in the following table.

Table #2 Comparison of Control Emissions

Source	Free Cl_2 (lb/hr)	PM (lb/hr)	HCl (lb/hr)
Permit R13-1934B[1]	0.124	0.4	210 mg/m^3
August 1, 2006 Test	1.01	0.034	0.049 (5.9 mg/m^3)
July 19, 2007 Test	0.034	0.030*	0.26 (34.85 mg/m^3)
Writer's Estimate	1.06	0.25	0.58

1 – Rule 7 Mineral Acids Standard for HCl (45CSR§7-4.2.).
* Two of three runs did not detect measurable quantities of PM (PM rate was below detection limit)

The PM rate estimated by the writer is based on the assumption that all of the injected chloride reacts to form ferric chloride or ferrous chloride in the form of PM. This does not exactly happen in this process. There is the potential for free hydrogen to be available which will be competing for the chlorine to form hydrochloric acid. Therefore, the writer's estimate is the maximum possible with no HCl being generated and no free chlorine being released.

Measured PM rates are lower than predicted because ferrous chloride and ferric chloride are both soluble in water and the rate of the reaction is unknown. Thus, the change in the ph of the scrubbing liquor did not enhance the PM removal efficiency of the scrubber.

REGULATORY APPLICABLILITY

This modification does not affect the applicable rules that these furnaces are subject, which is the PM and mineral acid limitations of Rule 7. The actual process that is being conducted is causing the graphite to undergo a chemical change, which means this process step is classified as a type 'd' source operation. Based on maximum process weight for each batch and process time, the allowable for either the Ajax or Pillar furnaces is 0.05 pounds per hour.

The results of the test conducted in 2006 and 2007 indicated with the current scrubber that the furnaces have achieved compliance with a margin of 40 percent. During these tests, visible emission observations were conducted and noted to be 0 percent opacity.

For Hazardous Air Pollutants (HAPs), the Anmoore Plant has the potential to emit just 11 tons per year of total HAPs with the largest single HAP release being phenol at 1.4 tons per year. The writer recommends increasing the annual limit up to 1.93 tons per year. This increase would bring the facility's potential to emit of HAPs just under 14 tons per year. Thus, the Anmoore Works would still remain classified as an area source of HAPs as a result of this project.

GrafTech submitted a complete application, published a Class I legal ad, and paid the application filing fee in accordance with Rule 13. The proposed and recommended changes to Permit R13-1934B would not change the Anmoore Plant's applicable status with any other rules or regulations. The facility would be required to file a significant modification application to its current Title V Operation Permit, which has been filed in conjunction with this application.

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

This proposed change will not emit any pollutants that aren't already being emitted by another emission source at the facility. Therefore, no information about the toxicity of the hazardous air pollutants (HAPs) is presented in this evaluation.

AIR QUALITY IMPACT ANALYSIS

The writer deemed that an air dispersion modeling study or analysis was not necessary, because the proposed modification does not meet the definition of a major modification of a major source as defined in 45CSR14.

MONITORING OF OPERATIONS

The writer recommends the retaining the same monitoring requirements expect for the following:

- Increase the frequency of monitoring the scrubber parameter to at the beginning and ending hours of the purification process step.
- Require the liquor level in the scrubber to be checked 24 hours before the purification process step is engaged.
- Require the spray bar and nozzles be inspected annually.
- Require the packing to be inspected, and/or cleaned/replaced as necessary.
- Calibrate all measuring devices in accordance with manufacturer's specifications annually.
- Omitted the visible emission check.

A water vapor plume should be present during the entire process step since the furnace will be operated at temperatures well above 1500^0C and venting to a wet scrubber. Thus, a Method 22 observation would not be appropriate for this type of exhaust stream. In addition, the PM from these furnaces with the packed bed scrubber is significantly less than the Rule 7 Allowable. The duration of the purification cycle is only a few hours and only one furnace can go through this operation step at a time. These furnaces should have been classified as type 'd' process sources with a much lower PM allowable under Rule 7. Thus, the approach of using visible emission observation to satisfy compliance with the actual PM allowable should not be used for this type of source and the focus on monitoring scrubber performance and maintenance is being recommended in lieu of visible emission checks.

The writer recommends establishing an annual chlorine gas usage limit, which would be a good indicator for compliance with the annual limits and place a limitation on operation for both type of furnaces without setting two different limitations. This chlorine limit is directly linked to the chlorine limit but it is indirectly linked to limiting the PM rate as well. The PM from this process will either be ferric chloride or ferrous chloride. Without the chlorine injection, this particulate matter would be generated from the process.

CHANGES TO PERMIT R13-1934B

GrafTech proposed to vent all of the induction furnaces to 055 scrubber and emission point EP-055. R13-1934B had 079 scrubber and corresponding emission point EP-079. This scrubber is no longer in service and cannot be used for the process as permitted in Permit R13-1934B. Thus, references to 079 scrubber and emission point 079 are being removed from the permit.

Other changes focused on ensuring proper maintenance of the 055 scrubber, which is noted in the above section, and correcting the permitted emission limits. The total chlorides limits are omitted because total chlorides are not the correct regulated pollutant in question. The regulated pollutants for this process is chlorine (classified as a HAP), hydrochloric acid (HCl) (classified as mineral acid and a HAP) and PM. The chlorine limit is being adjusted up to 1.06 pounds per hour and PM limit is being reduced down to 0.05 pounds per hour, which is the correct Rule 7 allowable.

RECOMMENDATION TO DIRECTOR

The information provided in the permit application indicates the proposed modification of the facility will meet all the requirements of the applicable rules and regulations when operated in accordance with the permit application. Therefore, the writer recommends granting GrafTech a Rule 13 modification permit for their graphite products manufacturing facility located in Anmoore, WV.

Edward S. Andrews, P.E.
Engineer

July 3, 2013
Date